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THESIS

DISTANCE EDUCATION: A CASE STUDY WITH APPLICATIONS FOR DOD AND THE MARINE CORPS

by

Christopher H. Biggs

June 1994

Thesis Co-Advisors: David R. Henderson
Frank Barrett

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Distance Education: A Case Study with Applications for DoD and the Marine Corps

by

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Submitted in partial fulfillment
of the requirements for the degree of

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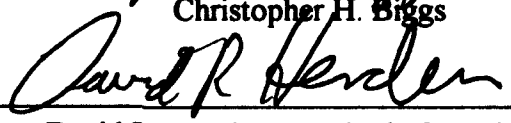
Approved by: 
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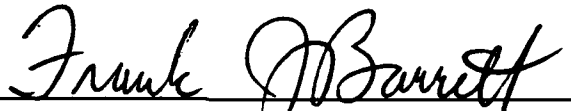
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ABSTRACT

This thesis is a qualitative analysis in the field of distance education. The author's research first established what technology is required for an organization to engage in distance education. Next, an argument was made through interviews throughout DoD and the Marine Corps indicating that implementation of distance education required strategic thinking and vision. Standardizing, outsourcing, and prototyping contribute towards effective implementing. Finally, a case study was conducted using a grounded theory approach with primary users of videoteletraining (VTT) from the Defense Language Institute of Monterey, CA. The goal of this research was to find common themes created from three focus groups concerning user reactions towards VTT. Important concepts emerged corroborating positive implementation theories: VTT instructors adapt quickly to the medium, VTT bridges the distance gap between student and teacher, and VTT encourages instructors to grow as managers of the medium. Overall, distance education is viewed as a viable option for DoD and the Marine Corps.

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I. INTRODUCTION

> Educators are not technology literate, and worse, very often are afraid to admit it. Historically and currently, there is little emphasis on how to plan, prepare and and utilize media in education. Portaway & Lane 1992

Institutions are confronted with the need to deliver more education despite decreasing resources and increasing costs of delivering such educational activities. The capabilities of telecommunications lend themselves to this need. Specifically, *distance education* is a special application of telecommunications to teaching and learning situations in which *learners* are geographically separated from *teachers and,* both depend on electronic devices to communicate (Keegan, 1983). Distance education provides an economically feasible way for institutions to succeed in times of "doing more with less". Media and technology provide the packaging and delivery for distance education. However, apart from the technical aspects, the feasibility of quality distance education is hindered by the possibility of barriers such as media-illiterate educators and high initial front-end costs. Nevertheless, Bowsher (1989) concludes that by the end of this decade most education will be delivered electronically. The success or failure of this vision depends on how fast information can flow and education can be disseminated throughout an institution.

This thesis investigates the relationship between distance education technology and training applications in the Department of Defense (DoD) and the United States Marine Corps (Marine Corps). The technology of telecommunications is briefly presented only to allow this document to stand alone as a complete reference for the non-technical reader. The thesis will focus on one form of distance education, videoteletraining (VTT). Other forms of distance

education such as computer-based instruction including computer-assisted instruction and computer-managed instruction that are stand alone applications will not be considered. Research was directed towards fully interactive two-way (audio/video) teletraining through the VTEL delivery platform.

Research methods employed to gather data include case study conducted at the Defense Language Institute, which has successfully conducted distance education through videoteletraining since 1990. Focus groups composed of primary users for videoteletraining (VTT) were conducted.

This thesis concerns itself with answering the following questions:

1. What level of technology is necessary for an organization to sustain in order to engage in distance education?

2. How will distance education through videoteletraining meet educational requirements of DoD and the Marine Corps?

3. Given that VTT is useful, what lessons can be learned from reactions of primary users that provides data useful to educational managers in setting up new VTT sites?

II. LITERATURE REVIEW

A. DISTANCE EDUCATION DEFINED

Distance education traditionally represents an approach to education under conditions where the instructional process separates the teacher and learner (Keegan, 1983). The traditional classroom is an island on which a teacher, a group of students, textbooks and other limited resources perform the educational process. Occasionally, students and teachers take trips into the outside world, but mostly education focuses inward on things happening in the classroom. Contemporary telecommunications technology can invert this traditional focus. Classrooms now face the world outside rather than the world inside. Instead of isolated islands, classrooms are linked by communication highways transmitting data (video and audio) to multitudes of remote sites. Teachers and students ride on this new information highway with easy access to vast databases and jointly participate in activities that involve other classes in other countries (Lynton, 1992). This new approach can educate students who are cut off from a competent, resident classroom environment. This can be due to many factors: geographic dispersion, temporary separation, or unavailability of locally qualified instructors. Distance education is the best alternative when a training facility cannot feasibly or economically provide quality face-to-face instruction to serve the remote students' needs.

Distance education does not replace face-to-face instruction. Bramble (1990) found that students prefer face-to-face instruction. Distance education presents a conceptual threat to the those involved in resident education (administration, instructors and staff). Therefore, distance education advocates must be careful to present the approach as an alternative to conventional instruction, to be used when conventional instruction is not feasible or uneconomical. Distance

education can be cost effective, although this can be hard to prove. Proponents must be cautious not to promote distance education solely on the basis of low cost. To support this emerging environment, which seems to offer such great potential, organizations must establish an infrastructure of policies and standards focused on long term strategies for efficient implementation of distance education.

Loose definitions of distance education read like a catch-all of phrases for something including technologies as old as correspondence study and as new as interactive instruction via satellite. For this thesis's purpose, distance education is the set of the following three elements:

1. Communication between the students and the teacher is not face-to-face.
2. An organization plans, coordinates and supervises the program.
3. A telecommunications-based delivery system is used (Portaway & Lane, 1992).

Distance education is an old approach, but it is also very new, moving in step with modern telecommunications. Technologies such as videoteletraining, satellite communications, and fiber optics offer broadened opportunities for distance education. These technologies provide education over longer distances while decreasing the perceived distance separating teacher and learner.

B. BRIEF HISTORY OF TELECOMMUNICATIONS

The potential benefit of face-to-face meetings without the inconvenience of travel (lost time and expense) has long captured the imagination of business, military leaders and educators. The fictional Captain Kirk routinely communicates with other starship captains and Starfleet Headquarters located light years away via a face-to-face video and audio connection. Beginning in the 1970s, significant progress was made specifically in the areas of transition from analog to digital signals and data-compression technology.

In the 1970s, the telephone companies began the migration from analog to digital transmission methods. Computers became a household word, with significant advances in processing power, speed and greatly improved methods for sampling and converting analog signals to digital bits. Digital signal processing offered a number of advantages in the areas of signal quality and analysis. However, storage and transmission needs still posed significant problems. In fact, digital representations created from an analog signal required more storage and transmission capacity than the original signal. Further advance was checked until reliable digital data compression technology became available.

1. Compression and Decompression

A number of compression techniques are currently under development to address the problems of storage and transmission. Video data is a natural candidate for compression because of the many redundancies inherent in the original analog signal. These redundancies result from the original specifications for video transmission which were required in 1950-vintage television sets to receive and properly display images. The majority of the analog signal was dedicated to timing and synchronization of the television set. Later on, many video data compression methods were developed at this early period that relied entirely on the elimination of this redundant portion of the signal. Such methods achieved a 50 percent reduction in the amount of data required. This compression data rate of 45 megabits per second (Mbps), (a 2:1 compression ratio) became the key threshold speed.

In the 1980s, telephone companies developed key data rate standards which, for the first time, began to work in concert with the video technology mentioned above. The first base rate was established at 56 Kbps, because it was the rate required for a voice phone call. Groups of 56-Kbps channels were gathered into a single larger channel which ran at 1.5 Mbps (now called a

T-1 channel). Groups of T-1 channels were gathered into a single larger channel running at 45 Mbps (or a T-3). Now, it was possible to transmit live video through the public telephone network. It was clear that compression to the T-1 rate (a ratio of 60:1) or better, was required to provide face-to-face communications.

In the late 1980s, several compression methods evolved going beyond simple redundancy elimination and began to analyze picture content. This new generation of video coder/decoder (codec) took advantage of human vision processing. The normal video frame rate in the United States is 30 frames per second (fps). This exceeds the requirements of the human visual system to perceive. Motion pictures run at about 24 fps. The perception of smooth motion can be maintained to between 15 and 20 fps. A frame rate reduction from 30 to 15 fps yields another 50 percent compression gain. A 4:1 compression ratio was achieved but this was still far from the 60:1 requirement for face-to-face communication.

In the 1990s, compression technology continued to increase ratios until new benchmarks were established at 1600:1 at 56 Kbps. Such phenomenal compression gains did not come without a picture quality penalty. The rush to 56 Kbps resulted in frame rates below 15 fps resulting in jerky movement pictures. Today's standard for face-to-face meetings remain in the range of increments of 64 Kbps with at least 30 fps (see H.261 standard).

Since such significant advances have been identified in transmission and compression technology, it is important to consider the three key components of videoteletraining: network, codec, and environment (see Figure 1). Note that the codec circle does not touch the network circle. This gap represents the current technological barrier, because most proprietary network providers allow only "approved" equipment to connect directly to a given network. The

integration of these components requires expertise beyond a normal organization's communications group. Therefore, a few of the important interface standards are presented.

2. Network

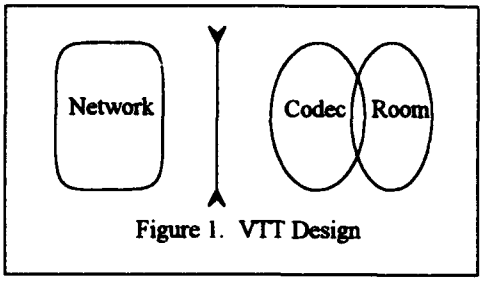

Figure 1. VTT Design

The network component of VTT refers to the medium wherein the video and audio signals are transmitted (see Figure 1). This is the realm of compression and decompression standardization, which can be either land-based or satellite-based. If signal compression rates differ, there will not be connectivity; therefore, it is important to have common standards. Common standards include the Joint Photographic Experts Group (JPEG), Consultative Committee for Telephony and Telegraphy (CCITT) H.261, and Motion Pictures Exerts Group (MPEG). All of these standards participate towards interoperable VTT transmission.

JPEG was developed in the 1980s to provide still image standards. Since then, it was adopted by the CCITT and has become the industry standard. The JPEG standard allows the same algorithms to handle both decompression and compression. As compression ratios increase, the quality of image suffers degradation. JPEG was intended primarily for still frame applications; industry movement has been to apply this technology to full-motion video as used in VTT.

The H.261 standard (also known as Px64) defines high compression ratios for full-color, real-time motion video transmission. The principal application is in the field of videoteletraining. "Px64 Kbps" refers to operation of the terminal at integral values of P up to a maximum of 30. Bit rate values for P which are of greatest interest are 1, 2, 6, 12, 24, and 30. Using the Px64

algorithm, a 384 Kbps signal (industry standard for VTT) is 6x64 where P=6. Because video-based telecommunications are not usually motion-intensive, adequate resolution can be achieved for compression ratios from 100:1 to over 2000:1. Tradeoffs are poor resolution and jerky images when fast motion is transmitted.

MPEG was instituted to answer this need for quality full-motion video. MPEG standards are 2-3 times more demanding in terms of quality resolution than JPEG. This means different algorithms and varying times are needed for compression and decompression. MPEG provides compression ratios from 50:1 to 200:1. MPEG is designed for motion-intensive video and is the standard for entertainment-quality video applications used in videoteletraining.

3. Codec (Coder/decoder)

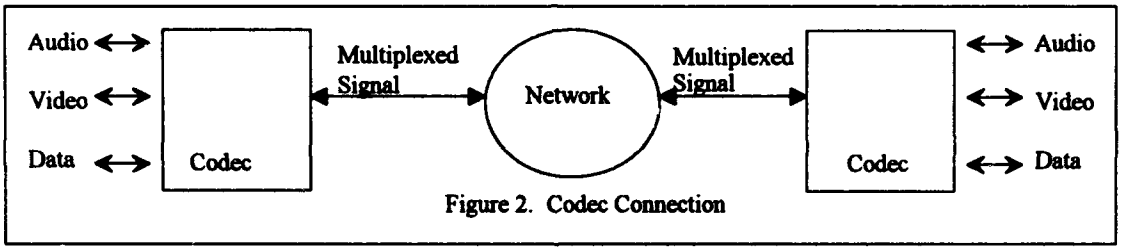

Figure 2. Codec Connection

The codec is the central component for all videoteletraining systems (see Figure 2). Codecs provide digitized and compressed audio and video signals for transmission. Multiple signals such as video, audio and data are simultaneously sent through a transmission network by a complex concept called multiplexing (see Figure 2).

4. Environment

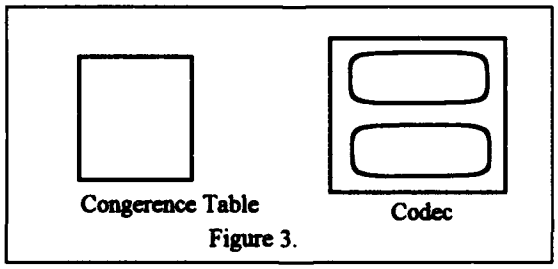

Figure 3.

The perfect videoteletraining environment is a room that feels as much like a normal conference room as possible. Those who use the room either as a student or instructor should not be intimidated by the technology. They should feel completely at home. The technology should be hidden or transparent to the user. In considering the room, physical environment and technology required must be considered. Room size and shape contribute towards how freely users interact with the system (see Figure 3).

C. DISTANCE EDUCATION VIA TELECOMMUNICATIONS

Videoteletraining can be defined as the integration of digitized video, audio, and data with state-of-the-art telecommunications technology into a videoteletraining system that effectively provides training to remote target populations. When building a system, special consideration must be given to the particulars of a videoteletraining system. The major distinguishing attributes are as follows:

- High-quality compressed digital video 384 Kilobits per second (Kbps) typical.
- Still-frame graphics multiplexed on video carrier and time-shared with motion video.
- Auxiliary data multiplexed on video carrier and time-shared with motion video.
- High quality, digitized audio (typically, 32 Kbps, multiplexed on video carrier and independent of motion video).
- Ku-band VSAT (Very Small Aperture Terminal) links.
- Multipoint interactive network.
- "Fully-bridged" separate audio.

D. APPLICATION

VTT applications must be networked through some transmission medium to reach the target audience. The transfer of huge digitized video and audio traffic brings most networking technology to a standstill. Also, the bit stream must arrive to the user in a deterministic manner or it will not make sense. This situation requires a combination of bandwidth and real-time delivery.

The compression techniques previously mentioned are critical to reduce the size of these files moving across a network. Several options have been developed to handle this "bursty" traffic.

- Fiber optics through Fiber Distributed Data Interface (FDDI).

FDDI allows for 100 Mbps bandwidth. This impressive data rate is flexible in that it can also be adapted for use over the less expensive twisted-pair telephone-type wire. It is a reliable and proven distributed network interface.

- Asychronous Transfer Mode (ATM)

ATM is well suited for carrying audio, data, and video traffic at a guaranteed 100 Mbps data rate. It uses a fast-packet switching technology that sends packets in a fixed size of 53 bytes. Industry-wide standardization and reliability problems have limited the use of ATM.

- Satellite Communications

Satellite communication has produced a quantum leap forward in long-distance communication. The United States is the leader in domestic satellite systems. Satellite video and audio relay is primarily used by broadcasters, cable TV, industrial and education users, and direct home subscribers (Freeman, 1991). The U.S. and NATO armed forces rely heavily on satellite communication for strategic, tactical, and support communications. Videoteletraining signals may travel by either satellite or land (terrestrial).

E. NETWORK MODES FOR VIDEOTELETRAINING (VTT)

An excellent example of the application of distance learning through telecommunications is videoteletraining (VTT). This section examines three of the most common modes of networking via VTT: broadcast, interactive, and multipoint (see Figure 4). Mode choice is dependent upon application.

- If there are many sites and interactivity is not required, consider the broadcast mode.
- If interactivity is needed and there is only one remote site, consider interactive mode.

- If interactivity is important to many remote sites, consider multipoint mode.

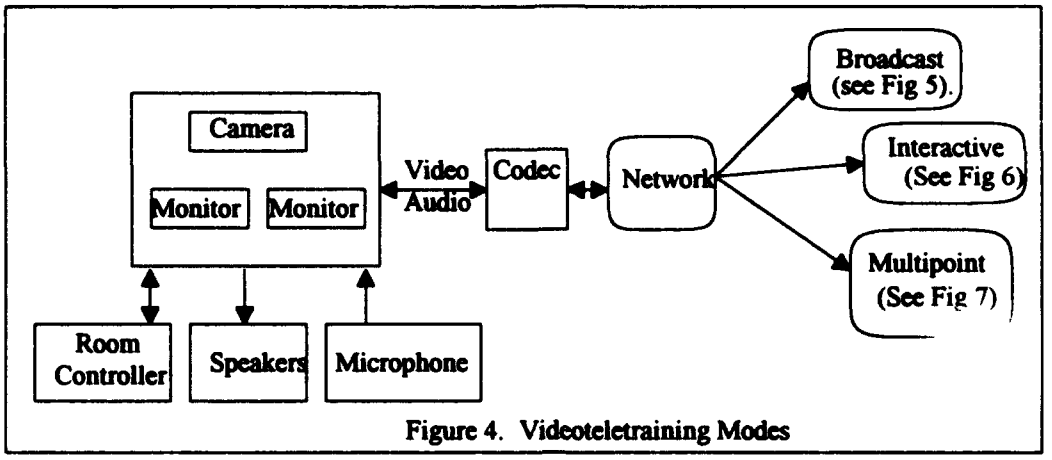

Figure 4. Videoteletraining Modes

1. Broadcast

Video and audio are transmitted form the host site to multiple remote sites. No video or audio is transmitted from any receiving sites. This mode is used for executive addresses, one-way classroom instruction, etc. (see Figure 5).

2. Interactive

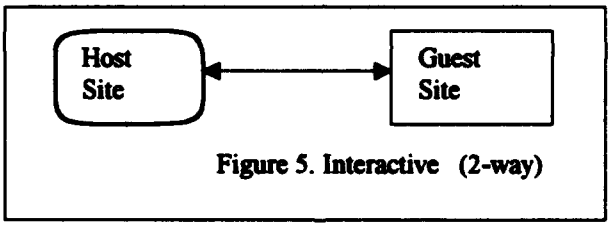

Figure 5. Interactive (2-way)

This is a refinement of the broadcast mode. In this case, two sites (guest and host) hold a fully interactive, dual directional (audio/video) conference (see Figure 6).

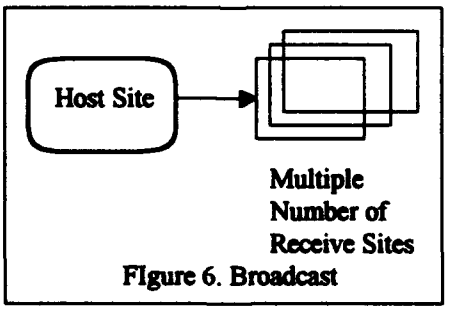

FIgure 6. Broadcast

3. Multipoint

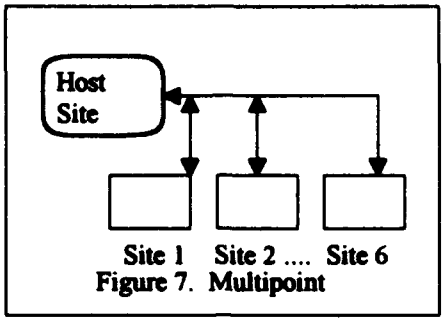

Figure 7. Multipoint

This is another refinement of the broadcast mode. Present technology allows up to 6 locations to hold a multipoint conference. The host site transmits the video and audio; other sites receive host video/audio, plus audio responses only from all participating sites. Additionally, any remote site may request to become host site (see Figure 7).

F. ECONOMIC INDICATORS

Rarely are economic data (i.e., direct and indirect dollar costs and benefits) analyzed before conclusions are drawn about the positive aspects of distance education (Hackman & Oldham, 1975). It is difficult to convert potential users to a new technological vision when the benefits are difficult to quantify. Traditionally it takes seven years to begin receiving returns on technological investments. This delay causes investors to balk. Future investment is a risk. The key is to prepare a strategy that provides for short term reviews of a long term plan. This plan should promise investors at least a logical rationale for some return on their investment. The idea is to re-evaluate distance learning investments in incremental (short-term) periods. Most distance education users have a hard time measuring economic success (Redding, personal communication, 1994). Success can mean increasing student throughput, establishing connectivity between students and learning resources, taking advantage of remote subject matter experts, and sometimes saving money.

Key management practices to save money are *outsourcing* (to displace some of the risk element) and *prototyping* (to demonstrate short-term goal attainment).

a. Outsourcing

Outsourcing represents an alternative to institute a supporting infrastructure. Outsourcing improves return on assets by moving these assets off the financial books while retaining control over their use. This relationship implies service level agreements for contract management whose goal is to increase power and reduce risk. Chuck Gibson of CSC Inc. (1993) says the goal is to improve return on investments by moving the information system out of the organization while retaining control over the system's use for the organization. There are several aspects of outsourcing information systems:

- Service agreements are contracted to ensure accountability and control.
- Information systems managers must trade their normal jobs for those of contract administration.
- Service contract administrators will have more power and less risk.
- Outsourcing vendors will choose their favorite platforms to achieve economies of scale.
- When outsourcing is used, information infrastructure will have a core of contract administrators and technical support personnel.
- Outsource strategic concerns misdirects focus of effort (Bergstein, 1993).

b. Prototyping

Prototyping is usually a software development concept. A prototype is a development tool where an experimental version of a new system is introduced based on specific user requirements. Enhancements and changes are constantly applied to improve the model's performance based on user inputs. A typical prototype has four to six iterations. In today's nanosecond world, the idea of developing a quick and inexpensive tangible product or goal on a trial basis presents an attractive option. A prototype is a live, working system. Most industrial infrastructures follow an evolutionary process. Entering into the infrastructure planning process

with a specific goal to be flexible to new relationships as they evolve, is revolutionary. Second, a prototype is created quickly. Sometimes to hesitate in pursuit of an opportunity is to lose the advantage to a competitor. Prototyping is also an iterative process. Start simple, focus on short term success, be flexible...these advantages offered by prototyping produce forward movement in an increasingly efficient manner (Sprague & McNurlin, 1993).

G. FUTURE OF DISTANCE EDUCATION

What is the future of distance education? Peter Senge (1990) observes that most organizations live only 40 years (half of a person's life time). A contributing factor is that organizations have "learning disabilities". What in children might be tragic, in organizations are fatal. In the 1990s, only those organizations that learn faster than their competitors are likely to survive. "Learning to learn" is the hallmark of a learning organization, an enterprise must adopt new learning and thinking behaviors for its personnel. Senge says today's complex organizations can be viewed only by looking for patterns and understanding the whole system. He calls this systems thinking. Four other disciplines are:

- Personal mastery. People reach a higher level of proficiency when they live creatively, striving for results that matter most to themselves. Their lives become a life-long pattern of learning.
- Mental models. These are the deeply ingrained assumptions and generalizations that influence how people see the world and what actions they take.
- Shared vision. A shared vision is an organization's view of its purpose. It provides the common identity which is both personnel and organizational.
- Team learning. Learning teams produce extraordinary results. Dialogues occur when people explore their own and other ideas without being defensive.

Distance learning can provide the connectivity to keep the relationship between student and teacher personal and continuous for life.

A major barrier to implementation of distance education is the lack of successful institutional planning (Portaway & Lane, 1992). Implementation of a distance education system

has never been documented. Portaway & Lane's study determined what critical factors leaders of successful distance education programs considered to be important prior to, during and following implementation of the program at their institution. Their study identified 20 critical success factors that should be considered to employ distance education (see Table 1). The model sets a high priority on human and fiscal resources. Implementation planning requires a major investment in time, people and funding. The most critical factor, need identification for the program, should be seriously considered. Without this need clearly defined, an institution should not purchase equipment, hire people, or even think about delivering a long-distance program. Other critical issues for successful implementations include: faculty involvement, program incentives, motivation, and training. The educator is a high priority in the delivery of long distance coursework (Portaway & Lane, 1992). Teachers fear being replaced by technology yet remain critical to the electronic classroom. Whereas specific success factors are critical, organizational decision makers need to consider all types of costs (capital, developmental and operating) before committing to establishing a distance education system.

Table 1. PRIORITIZED CRITICAL SUCCESS FACTORS (from Portaway & Lane 1992)

Critical Success Factors
1. Identified need for the program.
2. Faculty and teachers given incentives for motivation.
3. Funds for equipment, facilities.
4. Availability of on-going money for operations and expenses.
5. Quality of the educational content of the program.
6. Support staff to produce the program.
7. Equivalent learning experience to remote students.
8. Enthusiasm by the institution in the overall distance education project.
9. Strength of distance education built upon the strengths of traditiona classroom instruction..
10. Adequate remote sites, facilities, and staff.
11. Availability of specialized equipment.
12. Sufficient time for careful needs analysis: identify the range of services and programmatic needs of students.
13. Equivalent status for remote students.
14. Instructional design for production: the interactive components, length, frequency and number.
15. Marketing plan for the network or system.
16. Cost effectiveness: feasibility and justification.
17. Identified partners for the program: industry, corporate, legislative and, institutional.
18. Credibility of the program developed through public, faculty, students, and supporters.
19. Knowledge of administrators, teachers and staff at educational instutions on what distance education is and how to teach and use it effectively.
20. Offer accredited courses or be able to transfer credit across states.

1. DoD and Distance Learning

Distance education technologies have received considerable attention in the Department of Defense (DoD). Military training is ultimately linked to national security and national strategic objectives. With personnel drawdowns, base closures, increased emphasis on domestic issues, and reduced budgets DoD is eager to develop innovative training methods. For fiscal year 1994, DoD allocated about $15 billion towards individual training and education (MMTR, 1994). Providing training to the military is a complex issue. Difficulties arise about how best to train dispersed, autonomous units. Each military branch has different needs. The challenge is to

maximize resources available for training. Understanding when an approach can and should be employed and what benefits will be received is crucial for successful implementation. Wright (1993) provides the following scenarios when distance education technologies may be appropriate:

- Population is large and requires repeated training.
- Population is dispersed and cannot be economically transported to a central training site.
- Students in a training group have diverse learning styles, skills, or proficiency.
- Delivery must be closely monitored for accuracy or interpretation.
- Students cannot be taken from job for extended periods due to mission criticality .
- Live training is cost-prohibitive.
- Instructors with proper credentials are limited.

The above scenarios equally apply to all branches of DoD, including the Marine Corps. DoD has studied the merits of distance education in DoD: the Navy uses CESN, the Air Force uses ATN, and the Army uses TNET. Fletcher (1990) says distance education can:

- Provide a high level of job satisfaction.
- Be as effective as conventional training.
- Be as cost effective as conventional training.
- Be more effective with a supporting infrastructure.
- Be more effective when incorporated into a complete training system rather than as a stand-alone resource.
- Shorten the average time required to reach criterion achievement levels.
- Support downsizing in the military.

H. SUMMARY

Distance education is defined as communication between an instructor and student via telecommunications. Compression and decompression algorithms made it possible to transmit video and audio data over a transmission network through a codec. Networking offers many alternatives to the user. Finally, cost and benefit analysis has yet to justify tangible VTT benefits. To do this, outsourcing and prototyping offer attractive analysis options. The future for VTT in the military is tied to using the technology to help create learning organizations. VTT provides impressive potential to support a learning environment.

III. DISTANCE EDUCATION IN THE DOD

Military training is linked to DoD strategic objectives and national security. With the end of the Cold War, emphasis has changed to domestic economic issues. Military leaders search for ways to train in an atmosphere of downsizing (reduced budgets, and base closures). Concurrently, military systems have grown more numerous and more sophisticated. This requires better trained personnel to ensure their proper operation and maintenance (Fletcher, 1990). Even basic infantrymen carry laser targeting devices and global positioning systems. Overhead costs for fuel and ammunition continue to rise (Fletcher, 1990). Base closure, environmental concerns, and sensitivity to the use of Conus and overseas locations restrict training. How do you effectively train widely dispersed units, such as the National Guard (Fletcher, 1990)? The circumstances enhance the need for more productive and efficient systems.

The challenge is to find approaches to optimize training. Distance education offers one such alternative. However, it is not the panacea for all training problems. Understanding when to use it and what benefits will be derived are crucial for success. Wright (1993) provides the following scenarios when distance education is appropriate:

- Target audience is widely scattered and it is not cost effective or possible to have them travel to a central training location.
- Content or consistency in delivery is so critical that it must be carefully controlled for accuracy or correct interpretation.
- Content is too dangerous for novices to participate in and distance education will allow for familiarization and confidence building prior to the actual situation.
- Scheduling difficulties arise because the student cannot take extended time from other critical missions to attend a normally conducted training program.
- The expense of conducting live training is cost prohibitive.
- There are a limited number of qualified trainers.

All above scenarios apply to training situations within DoD. Fletcher (1990) conducted research in response to Congressional inquiry concerning the use of distance education within

DoD. Indications of cost effectiveness only suggest rather than indicate conclusive relationships. None of the reviewed studies examine cost and suggest effectiveness in an empirical manner based on cost inputs and effectiveness outputs. One fact upon which all references agree is that distance education will initially be more expensive in development than conventional training, because computer hardware must be purchased and multimedia courses must be developed. During the delivery and maintenance phases, distance education training costs are considerably lower than conventional training, because savings are obtained in the following areas: travel costs, reduced instructors, administration, training materials, and equipment. When an entire life cycle is considered, distance education is more economical than conventional training. As more students use distance education, the cost becomes lower and lower (Bass, 1993).

Distance education requires tradeoffs. It may be more economical for an entire life cycle, but requires large outlays of capital during development. With today's tight budgets, funding is difficult to obtain in a Program Objective Memorandum (POM) initiative. One must know when distance education is appropriate and what are potential benefits (Wright, 1993). There are training situations that are not right for this technology. For example, participating in a physical conditioning hike with a pack and rifle or navigating with map and compass are best experienced in real life (Sweltz, 1993).

Proper implementation of distance education requires strategic thinking and vision. The goals of an organization must be considered, when comparing costs, benefits, and limitations. Distance education should be reviewed in terms of funds allocated and return on investment. Strategic thinking should not be limited to monetary concerns. Other benefits offer valid consideration. Comocowich (1992) says strategic thinking should encompass concerns for:

better trained personnel, availability of courses that couldn't previously be provided, and the ability to offer training around almost any schedule.

Distance education is best at doing things that other training cannot accomplish. Innovative leaders will find economical and efficient solutions to training problems. The key will be to choose applications to implement the technology so effort and funds will not be wasted. An initial successful implementation sets the tone for future system acceptance.

Fighting obsolescence by chasing after the latest telecommunications technology can be self-defeating. Emphasis for distance education should be on course content and quality management. Kent Thomas of Allen Communications (personal communications, 22 December 1992) believes that quality control should be the priority because only quality applications stand the test of time and easily transition to new delivery platforms.

Converting conventional training to distance education requires prior process improvement and re-engineering. If a course is not a solid instructional tool, turning it into a distance education version will not make it so. A distance education course, based on a poor conventional one, will fail. Fixing it requires larger expenditures of time and money than doing it right the first time.

DoD is the biggest customer of distance education technology (Payne, 1991). The primary users to date have been the Army, Air Force, and Navy. The Marine Corps has played a minor role. The use of distance education is well established and accepted as a viable training alternative. By 1995, DoD distance education investment is expected to reach $896,000,000 (Demott, 1992). In an environment of downsizing and budget cuts, distance education as a training alternative will likely increase.

A. STANDARDS IN DOD

Standards are crucial because they allow information to be transmitted between disparate systems. For example, videoteletraining systems require standards for transmission and a common definition of connectivity. The information infrastructure needs to provide direction and selection of these standards. Information infrastructure should follow strategic planning. At a time when the warrior's job is likely to be a contingency response in a politically uncertain world, joint service integration is paramount (C4I for the Warrior, 1993). Careful consideration for future connectivity should include joint standardization. The clearer the overall standards become, the clearer the overall architecture.

Connectivity commonly means interfacing many dissimilar systems. The goal today is not a single, coherent system. The key is to build systems that are coherent at the interfaces. Let the users think they have one system. Connectivity spans technical, interoperable and procedural requirements. Connectivity implies interoperability. Interoperability promises the linkage of all user to provider systems. This means that different information systems using different transmission technologies will be able to work together to exchange information.

Furthermore, Sprague and McNurlin (1993) suggest the following factors to consider when establishing standards for an information infrastructure:

- Define the user: global, theater, regional, group, department, and individual.
- Require open architecture: to ensure platform interface and interoperability.
- Define the environment: what are the internal and external demands.

Overall, standards should be the foundation of the architecture to enhance long term benefits. Look to the central agency for policy guidance. Look to subordinate components for standardization enforcement. Tailored solutions should be reserved to fill gaps where standards are not yet available. All standards should function as "open networks". Open systems should be

based on national and international standards to provide for universal interoperability. The following section discusses published, transmission and interoperability standards.

1. Published Standards

a. FIPS PUB 178

All VTT procurement standards for systems operating between 56 Kbps and 1.92 Mbps (Standard bandwidth for today's systems.) must conform to the requirements identified in the Federal Information Processing Standards Publication 178 (FIPS Pub 178). FIPS publications are adopted by the National Institute of Standards and Technology (NIST). This publication references the five CCITT international VTT standards:

- H.221. Frame Structure for a 64 to 1,920 Kbps Channel in Audiovisual Teleservices, 1990.
- H.230. Frame Synchronous Control and Induction Signals for Audiovisual Systems, 1990.
- H.242. System for Establishing Communication Between Audiovisual Terminals Using Digital Channels up to 2 Mbps, 1990.
- H.261 Video Cec for Audiovisual Services at Px64 Kbps, 1990.
- H.320 Narrow-band Visual Telephone Systems and Terminal Equipment, 1990.

All Federal departments and agencies must comply to the interoperability criteria for VTT applications. FIPS Pub 178 represents the latest international standards to ensure interoperability within common operating bandwidths.

b. MIL STD 188-331 (Draft)

The draft Military Standard for Interoperability and Performance Standard for Videoteleconferencing, MIL STD 188-331, provides DoD with interoperability between video teleconferencing terminal equipment. The standard applies to all procurements initiated for DoD. Examples include roll-about units, portable, modular and desktop systems, studios and personal computer cards. All procurement must adhere to open systems architecture. Even though it is in

a draft stage, it constitutes the real standard all DoD VTT acquisition follows (Major S. Gaudreau, personal communication, 21 January 1994).

c. Marine Corps Standards

There are none. A Marine Corps Bulletin is currently in the draft stage with an order to follow next year (Gaudreau, personal communication, 29 January 1994). Oddly enough, this situation is not the problem it may seem. Lack of standards and policy mean that the technology is so new that application to the specific service departments is evolving. High front end cost has slowed adoption of standards; this will be discussed in the benefit and cost section to follow.

2. VTT Transmission Standards

There are multiple vendors of the VTT transmission medium some of which are mandated by Congress others are proprietary.

a. FTS2000

FTS2000 is a general purpose telecommunications network managed by the General Services Administration (GSA) . FTS2000 provides services primarily to DoD organizations. It is divided into an (a) part corresponding to the 60% of the FTS2000 service provided by AT&T and a (b) part corresponding to the remaining 40% provided by Sprint. The (a) network uses AT&T's Compressed Video Transmission Service (CVTS), while the (b) network uses Sprint's Meeting Channel services. Currently, these systems are not interoperable, but GSA is actively working on this problem and attempting to promote compatibility with the Defense Commercial Telecommunications Network (DCTN) as well (Gaudreau, personal communication, 21 January 1994).

b. Defense Commercial Telecommunications Network (DCTN)

The DCTN is a secure conferencing network used by the DoD under contract with AT&T. It is intended for use by senior DoD military, civilian personnel, and training (Pugh, 1991). This service contract will expire in 1995 (T. Schnabel, personal communication, 27 January 1994).

c. Teletraining Network (TNET)

TNET is an example of an interactive system that integrates interactive video, graphics and computer-based teletraining technologies. TNET meets FIPS PUB 178 Standards. VTEL, Inc. is the commercial provider for TNET. Oklahoma State University is the prime contractor which is teamed with Compression Labs transmitting over Hughes Network System's satellites. Network control is provided by the Network Control Center at Fort Eustis, VA. By the end of 1994, as many as 120 Army and Air Force sites will be operational. The Navy uses another version from VTEL with a 20-site multipoint control unit. Economies of scale are beginning to pay off. Furthermore, a backbone level of VTT media expertise is beginning to emerge by those participating service branches (Captain Skinner, personal communication, 21 January 1994).

3. Interoperability Standards

As indicated above, GSA, AT&T and Sprint are working toward a more open approach to videoteleconferencing on FTS2000. Besides allowing government agencies to provide their own privately-owned vendor hardware and software, GSA is negotiating with Sprint to bring VTT service transmission speeds down from 768 to 384 Kbps. This promotes compatibility with AT&T's service operating at 384 Kbps. The Defense Commercial Contracting Office (DECCO) is specifically sited in the above DoD Instructions as the general purchasing agent for DoD

components who wish to contract procurement of telecommunications, including both hardware and software. DECCO provides such services as billing, vendor accounts management, contract management, database services, and contractor bidding. However, DECCO charges 2 percent of the contract award amount for the use of its services (B. Jarvis, personal communication, dated 25 January 1994).

Whereas DECCO is the contract consultant agency for DoD, components may or may not choose to use this service. The Defense Information Systems Network (DISN) is the next management phase for handling the telecommunications needs of all federal agencies (Brewen and Bass, 24 January 1994). The intent of DISN is to present a template for FTS2000 follow-on. FTS2000's contract expires in 1998. This common template will allow DoD to take advantage of rapid changes in the telecommunications marketplace. Ultimately, DISN will become the center of the Government Information Infrastructure which will then become the National Information Infrastructure (Brewen and Bass, 24 January 1994).

B. BENEFITS AND COSTS DIFFICULT TO ASSESS

Mr. G. A. Redding, Director of Distance Learning from the National Institute of Standards and Technology (NIST), said that most cost analysis in DoD has been flawed, because one can only save what money is available to spend. For example, if there were an approved language training budget of $500,000, and videoteletraining trained "X" students using only $400,000, then there was a savings of $100,000. If there was no *approved* training budget, then no savings were recorded. In the latter case, training was provided from funding approved under another budget. This is why actual costing becomes so difficult (G. Redding, Personal communication, 13 February, 1994).

Another example is the Army's videoteletraining programs, which have been working since 1989. The Training Development and Analysis Directorate (TRADOC) was given the mission to develop a training program to reduce the time soldiers spend in resident training (Wilson, 1992). As of 1992, over 32,500 students have graduated from the Army Logistics Management Course (ALMC) and TRADOC Teletraining Network (TNET) conducted via VTT. Using this population, a cost model of the three most expensive teaching styles (resident, VTT, and mobile training team) was constructed. The model included: instructor salaries, facilitator salaries (VTT only), equipment costs, prorated and shared overhead operations, and temporary additional duty (TAD) costs. Wilson says, that costs were based on a training year of 245 class days, the following average per student expenses would result:

Tangible Benefits	**Dollar Cost**
• Resident Instruction	$48,647
• VTT	$22,310
• Mobile Training Teams	$19,190

Student travel and per diem costs escalated the resident instruction total of $48,647 (as noted above). Mobile training team instruction requires teachers to travel to remote student sites and teach resident courses. A school must have enough instructors to send qualified teacher on the road to make this option practical. The remote site must also be able to provide required facilities for instruction. With these caveats in mind, VTT offers a viable training option.

Wilson makes a strong point in favor of VTT, but omits to include that VTT course lengths are not taught full-time throughout the training year. Courses are normally 2-3 months in

duration and meet only for 1-2 hours per training day. His data is impressive but misleads the reader to assume that VTT courses are taught at the same intensity as resident training.

Furthermore, Wilson (1992) states that VTT also offers other non-tangible benefits. The emerging results add to the evidence that video teletraining can be an effective medium to replace resident training. Some of his conclusions are:

- VTT is popular with both instructors and students.
- Students learn at least as well or better than resident students.
- Courses can be quickly adapted to mission requirements.
- VTT helps to standardize training.
- VTT increases availability of service members to parent commands.

C. DISTANCE EDUCATION IN THE MARINE CORPS

Currently there is limited use of distance education to support training applications within the Marine Corps. According to Captain K. Skinner (Personal communication, 22 February 1994), Director, Training and Education Section at Quantico, VA, all development is *ad hoc* by local commands, with only loose adherence to the DoD standards previously discussed, and there are no Marine Corps-wide distance education training applications. Major S. Gaudreau (Personal communication, 21 January 1994), Marine Corps Computer and Telephone Agency (MCCTA), also at Quantico, VA, stated that the Marine Corps considers videoteletraining (VTT) and videoteleconferencing (VTC) as two different systems. The VTT system is land based through the telephone transmission lines, and the VTC is satellite based. Admitting that both systems use the same digitized signal, he could offer no explanation besides "that is the way is right now".

As a result of finding so few distance education projects in the Marine Corps, my investigation was expanded to find the reasons. Captain Skinner's office coordinates all distance

education for the Marine Corps. He (Personal communication, 22 February 1994) indicated that there is very little distance education occurring in the Marine Corps. In addition, what is being done is *ad hoc* and often of poor quality in terms of either following a systems approach to training or using the technology itself. One of the biggest obstacles is a lack of research and development money to fund proper implementation. Another major reason was the lack of infrastructure in the Marine Corps to support development. Unlike other services that have a career track with military and civilian personnel dedicated to the acquisition, development, and management of distance education, the Marine Corps has less than a dozen people involved in this area, and the people who are involved do not do it as a primary function.

Ms. M. White (Personal communication, 15 August 1994), an Instructional Systems Specialist, works with Captain Skinner. She previously worked with the Army in their distance education programs. She is the principal action officer for distance education. She provided the following reasons for the current lack of Marine Corps development and use:

- There is a high cost of initially purchasing equipment.
- There is a high cost of developing quality courses.
- There is general lack of knowledge by educators to either use or manage the medium.
- There has never been a top level champion for this type of training.
- Local commands that have initiated distance education applications are reluctant to share this with headquarters because of fear that their efforts may be stopped or changed in a direction they do not want.
- There is a reluctance in the Marine Corps to use applications developed by other services because they feel it may not take into account the requirement needed to properly train Marines.

Furthermore, Skinner (Personal communication, 2 March 1994) provided these additional reasons:

- Any training tied to new technology could become invalid as technology grows obsolete.
- The training establishment fears that technology could replace people.
- Many Marines in the combat arms fields want available funds to go to field training and are reluctant to consider funding non-combat applications.

Although distance education has not been tested in Marine Corps training applications, it shows great potential. Training within the Marine Corps is a large undertaking involving considerable expenditures of personnel and money. *The Military Manpower Training Report (MMTR) for FY 1994* provides some idea of the scope involved. Training load is defined as the average number of students and trainees participating in formal institutional training and education courses during the fiscal year. The projected Marine Corps training load for FY 1994 is 19,000 personnel for the regular Marine Corps and 3,500 for the Reserves. Individual training requires manpower to conduct and support instruction, manage military schools and training centers, maintain training bases, and provide support to students, staff members and their dependents. Projected manpower in support of individual training of the Marine Corps in FY 1994 is 11,000 military personnel and 1,000 civilians. Funding required for training includes pay and allowances for the students and trainees undergoing operations and maintenance costs, and training-related procurement and construction. The projected Marine Corps total for FY 1994 is $1,350 million.

D. SUMMARY

1. Strategic Thinking Supports VTT

Proper implementation of distance education requires strategic thinking and vision. The goals of an organization must be considered, when comparing costs, benefits, and limitations. Distance education is good at doing things that other training cannot accomplish. An initial successful implementation sets the tone for future system acceptance. Concerns about VTT are that are that instructors are afraid of the technology and top-level champions are needed to push the new initiative along. Also, converting conventional training to distance education requires prior process improvement and re-engineering. Overall, distance education can be more effective when incorporated into a complete training system rather than as a stand-alone resource.

2. Standards Support VTT

a. Technical Standards

The standard presented by FIPS Pub 178 clearly provides direction and general policy guidance. The follow-on DoD level standards discussed emphasize the importance of "open architecture", and recognize that tailored solutions may be required to fill gaps where standards are not yet available. Table 2 summarizes DoD, and the Marine Corps VTT infrastructure standardization concerns.

Table 2. INFRASTRUCTURE STANDARDIZATION

Factors	Information Infrastructure	DoD VTT Infrastructure	Marine Corps VTT Infrastructure
Define the user.	Global, regional, group and departmental.	CCITT standards referenced.	Follows DoD guidance.
Require open architecture.	Ensure platform interface and interoperability.	MILSTD 188-331 has interoperability standards.	Follows DoD guidance.
Define the environment.	Existing system users both internal and external.	TNET is one example of many which are emerging.	Outsource risk and focus on internal system expertise.

b. Management Practices

Outsourcing and prototyping should be applied to a DoD VTT infrastructure. The obvious idea is to marry commercial technology to new organizational structures to develop a new way to do business. Let the components of DoD (Army, Navy, and Air Force) validate the application, then the Marine Corps should step in with a well thought out plan and support structure. Make the project profit responsible to provide an interoperable and efficient service. Measure short term applicability and make incremental advances.

user assumes less risk and enjoys the benefit of evolving technology without sunk cost investments. Outsourcing creates an environment to develop professional contract administrators and the opportunity to focus on professionally developing the technological media. Finally, the user enjoys economies of scale when more remote sites subscribe to the medium.

Table 3. TNET OUTSOURCE CONSIDERATIONS

Outsourcing Consideration	TNET Example
Contracted service agreements are easier to manage than large dollar system purchases.	Technical support jobs are displaced with contract administrator responsibilities.
Develop core of contract administrators.	More power to user.
Outsource vendors use platforms of choice, thereby achieve economies of scale.	Established over 120 TNET sites.

2. Prototype Initial Applications. Outsourcing in the TNET example above presents simply another name for prototyping. Using an outsource vendor immediately provides a live, working system. Start simple, focus on short term success, be flexible in regarding to emerging advantages in technology and internal support development-the advantages of outsourcing and prototyping are not easy to dismiss.

IV. METHODOLOGY

To investigate the role of VTT in the educational program of the Marine Corps, a study was conducted of the use of VTT in an analogous role: the Army's Defense Language Institute (DLI) in Monterey, CA. using focus groups. Emory and Cooper (1991) recognize five traditional research strategies: experiment, history, survey, focus groups and case study. This thesis deals with case studies and focus groups. These strategies address the "how" or "why" research question. Focus groups demonstrate the power of interpersonal dynamics to focus a small group in an exchange of ideas and experiences on a commonly understood topic. The output of focus groups enriches all levels of research questions. Case studies focus on current conditions where the researcher exerts no control over the behavior of the people involved in the case.

The method used for data analysis was inductive grounded theory (Glaser and Strauss, 1967), that attempts to discover patterns and themes that emerge from the data. Constant comparative methodology is a process using trial and error grouping of common concepts, constantly holding them up against other tentative concepts, to see how these new groupings hold together. After repeatedly analyzing the data in this way, a list of themes emerged.

In the analysis model, theory is not tested but built from the ground up, using the data gathered from the focus groups. An indicator of successful focus group methodology is when the participants' data (quotes) becomes repetitive. Glaser and Strauss (1967) refer to this as *saturation.* Where possible, connections will be made between every theory and themes that emerge.

A. FOCUS GROUP OVERVIEW

Focus groups are planned and moderated group discussions whose purpose is designed to record information in an area where such free-flowing disclosures are not normally encouraged. Groups are small and composed of people who have some expertise, allowing meaningful data collection on a particular topic. Focus groups collect qualitative data and offer rich insights into the subject matter. Group dynamics and shared ideas provide results not obtainable from other research methods (Emery and Cooper, 1991).

Focus groups are particularly useful for exploratory research where little is known about the subject. Focus groups may be used at any point in the research effort. In fact, President Clinton makes extensive use of focus groups to elicit the population's feelings before he embarks on a particular path. Notice, in his speeches, how the President's choice of verbiage seems so natural. This happens by no coincidence (Wartzman, 21 March 1994). Examples of focus group usage are:

- Obtaining background information about a topic.
- Generating hypotheses for further research.
- Learning how respondents feel and think about the phenomena of interest.

Focus groups represent only one research method available to the researcher. Advantages and disadvantages must be considered to obtain the desired research objective (see Table 4). When used appropriately, focus groups provide data that could not be obtained from other means.

Table 4. ADVANTAGES AND DISADVANTAGES OF FOCUS GROUPS

Advantages	Disadvantages
Provides data quicker than other forms of participant research.	Small groups lead to misleading generalizations.
Moderator is allowed to interact with the group. ask follow up questions, and interpret nuances to add meaning to responses.	Moderator bias may influence group behavior.
Provides data in the respondents' own words.	Credibility may be overrated due to live interaction of respondents.

The research sequence of this study is unique. The literature does not reflect anyone developing a case study of an actual successful organization, validating the author's understanding of the environment through focus groups and validating this perspective through an organizational diagnosis. The role of this research methodology will be to better understand the application of distance education through a successful organization practicing it through videoteletraining.

B. CONDUCT OF THE STUDY

1. Purpose and Objectives

The Defense Language Institute of Monterey has been practicing distance education in the form of videoteletraining (VTT) since 1990. Their rapidly expanding program began with one remote site and grew to 38 in 1994. Furthermore, from 376 hours of operation in the first year, the program has grown to over 15,000 hours in 1993. DLI has received numerous military and civilian awards for its contributions towards excellence in VTT. The Director of the Distance Education Section and his on-site coordinators were most cooperative in coordinating and assisting all research efforts. Specific objectives were:

- To validate the applicability of Lane's Critical Success Factors by people who actually work in the field of distance education.
- To learn the opinions and ideas of experienced instructors, coordinators and facilitators about how distance education works at DLI.

- To stimulate ideas and discussion that would provide insight to how distance education may be implemented in other organizations in the future.

2. Focus Group Sample

The staff at the Distance Education Section provided *carte blanche* support in supplying names and address of local instructors, coordinators and remote site facilitators. Focus groups were selected by dividing the total of 18 instructors equally among three groups. DLI coordinators participated in each respective group. Remote site facilitators participated with only one remote site per focus group due to a short term technological limitation as the system underwent upgrade. This mix provided homogeneity. Homogeneity is important to obtain some form of consensus on specific issues. Although, the instructors collectively possess similar skills as educators, they collectively teach at least six different languages. Furthermore, no two instructors in a single focus group were from the same country. Participant diversity is necessary to ensure a lively discussion (Kruger, 1988). Each focus group was video recorded. This recorded information constitutes the actual focus group analysis data.

The three DLI coordinators were originally instructors in three different languages. As the distance education program expanded, these individuals demonstrated skills and desires beyond instruction and soon were involved in the scheduling and overall management of the program. They bring unique qualifications to management in that they understand the demands of instruction with its requisite standards for quality control, and they personally work with the local educators and remote site facilitators. This mix of *instructor* with high standards for quality of instruction and in-depth understanding of the rigors of teaching, and *manager* with a daily teaching schedule sometimes spanning 24 hours, creates a unique blend of coordinator.

Collectively, this management team spans the gap between doer (instructor) and manager (coordinator).

3. Focus Group Size

Kruger (1988) recommends that the number of participants for a focus group range from four to 12 people. Less than four members loses the beneficial effects of group dynamics, while greater than 12 proves unmanageable for the moderator and discourages individual participation. Seven participants was the prudent middle number chosen for each group. Kruger also recommends that three to four groups be conducted to provide a broader population perspective. Using at least three groups allows for comparing and contrasting different viewpoints that may not be exposed if fewer groups are used (see Table 5).

Table 5. FOCUS GROUP COMPOSITION

Group	Total Population	Actual Focus Group Size
Instructors	18	15 total / 5 per group
Coordinators	3	3 total / 1 per group
Remote Site Facilitators	18	3 total / 1 per group
Total	39	21 total / 7 per group

4. Focus Group Location

All focus groups were conducted using VTT labs at DLI. The first two focus groups were recorded in VTT labs connected to remote sites via satellite in 2-way audio/video interactive mode. The third focus group was recorded in a VTT lab connected to Kunia, Hawaii via T1 fiber optic oceanic cable.

5. Focus Group Procedures

I moderated each focus group. Each session lasted only one hour and was videotaped. The focus group discussion guide (see Appendix A) was developed using Portaway and Lane's

(1992) critical success factors interpreted into an appropriate format for focus group discussion. I reduced the 20 critical success factors to the following:

1. Do you find distance education to be a satisfying field? If so, how is it motivating?
2. How much enthusiasm does your organization demonstrate towards distance education?
3. What do you think about funding issues for distance education?
4. How would you compare traditional teaching methods to distance education?
5. What are your concerns for the future of distance education?

Discussion guide goals were displayed on the still frame viewer throughout each session for both local and remote sites. Each session started with opening comments by the moderator who explained overall goals and conduct guidelines. Demographic information was collected. A summary discussion on attitudes concerning the future of distance education and summary comments concluded each session. Immediately, the author noted personal comments after each focus ended. Results of the focus groups (13, 19 and 20 January 1994) are presented in the next chapter. This discussion includes both descriptive and interpretive analyses.

V. ANALYSIS

The analysis of the data in this study yielded six prominent themes. These themes are presented with supporting discussion drawn from the focus groups. Each theme is reinforced with focus group quotations to exemplify the flow of discussion[1]. The analysis produced the following themes about VTT:

1. Created fear among instructors.
2. Anxiety evolves to enthusiasm.
3. Instructors work harder.
4. Overcomes distance between student and teacher.
5. Improves student performance.
6. Instructors feel commitment.

A. THEME I. VTT CREATED FEAR AMONG INSTRUCTORS

1. Theme

When the new technology was introduced, the instructors felt intimidated, fearful, and hesitant to introduce it into their teaching. VTT interrupted their normal teaching routines.

2. Discussion

Initially, all instructors were given an introductory two-week class. They enjoyed the class, but were still anxious to sit in front of a camera as they taught. They were confident in their ability to teach the language, but their fear of performing in front of the camera's gaze was an obstruction and annoying. Most of the instructors had spent years in the classroom in the roles of teacher as well as student. It seemed to them that the presence of the camera, especially the idea of being watched by people at a distance, made them very self conscious. Many said they felt inferior and not "technologically minded" enough to manage the new technology.

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[1]All italicized and single spaced text in this chapter represent focus group member quotes taken from transcriptions.

Instructors also expressed frustration and fear that they would be unable to adapt or not adapt quickly enough. The technology was being thrust upon them. So much organizational effort was devoted towards technological concerns that the instructional need for teachers was glossed over. There was an unspoken tension to perform or be pushed out of the way. One instructor discussed how she felt instructors were left out of the transition.

> *I heard a story about George Burns and his wife Gracie which is a lot like the way it was for us in distance education. When George was asked if his wife was a good cook, he hesitated and said...yes. Eventually, Gracie piped in saying her favorite meal to prepare was pot roast. She always cooked two roasts, one large and one small, together. When the small one burned, she knew the large one was perfectly done. This is the way it was with VTT at first. They [the technicians] spent so much time to make sure the technology was good, that they forgot about us [teachers] who had to use the cameras and all the other stuff. If you couldn't adapt quickly, you got frustrated and quit, like the burned pot roast. VTT, the perfectly cooked roast was left for the next person to enjoy. At first I felt frustrated too.*

Some instructors felt dependent on technological specialists to guide them through what they feared would be an intimidating experience.

> *When I sat down in the studio to teach my first solo class, I refused to do it unless there was someone with me who could get me out of trouble if I goofed up.*

Teachers were resistant when it became time to address the camera. Every panel member agreed to this initial resistance and shared amusing anecdotes. For some, taking the first step was the hardest part.

> *I didn't come to VTT until my friend and colleague dragged me to the studio and showed me how easy it was. After that first time, I was hooked.*

One instructor expressed self-consciousness about her appearance.

> *It took me a long time to agree to try distance education. Not because I didn't think I could do it, but because I didn't feel attractive enough to be in front of a camera like on TV.*

B. THEME II. ANXIETY EVOLVES TO ENTHUSIASM

1. Theme

After an early success, instructors enthusiastically began to explore the use of VTT technology. Champions of VTT emerged, and they influenced others to try the medium.

2. Discussion

The experience of VTT was new. Much was invested in the technology with minimal regard for the fine points of application. Those who initially worked with VTT felt pressure to perform. Once an instructor forced him or herself through coercion or curiosity to try distance education, enthusiasm replaced fear.

After a given language class is contracted, the assigned instructor is personally committed for the duration of the contract. Contracts range from 4 to 40 weeks in length, depending on the scope of instruction. One of the first instructors, who taught German, started the distance education program responding to a training request from Ft. Meade, VA. She quickly became very enthusiastic about the potential of VTT and became one of the champions of the new technology, influencing others to try it out.

> *I was one of the first VTT instructors. For me it was easy. I just took to it naturally. Since my first class, I looked forward to each class. Classes were smaller [6-10 students], and I looked forward to it each day. When they [Distance Education Section] offered me the chance to teach other teachers [how to use VTT], I said "yes" right away. I really wanted to give my fellow teachers the same enjoyment that I felt. And I did. VTT for me was a working vacation.*

Many were influenced by this teacher's enthusiasm and were open to learning about this "foreign" technology from her. While reminiscing about their first VTT experiences, teachers expressed surprise that it really worked. This surprise emerged into a genuine feeling of fun: the pleasure of learning and using a new technology.

> *It's incredible, it's fantastic, heavy. It's like riding in a Ferrari or a Maserati.*

It's fun, different. It's a novel and pioneering way to teach.

We were successful! Us early instructors paced the lessons and rapidly changed activities. By tailoring up or down, we reached and motivated the students. That motivated us.

Getting past the newness of the technology represented a rite of passage. Work teams emerged to meet the uncharted need to deliver instruction via VTT. This relationship remarkably resembled a concept used by 3-M called "skunkworks," where employees devote a portion of their time to helping develop new and innovative ideas (Peters, 1992). The product of this teamwork was greater than the sum of the individuals' products.

It's very rewarding to be in a skunkworks environment, and simply being a participant in it means that we are privileged characters.

The enthusiasm of the VTT instructors became contagious. Teachers began to believe in the potential of this advanced new technology and the role they play in its evolution.

Before, nobody liked it [VTT]; now everybody wants VTT. Once they see how happy we are, how much we gain in experience, everyone would like to come to it.

The fun of being in this group, we all have come to respect one another and appreciate mutually the freedom that we have in this environment

Other comments centered around common sense implementation concepts, echoing the idea that you have to walk before you can run..

Present simple topics first and then expand on them once they are mastered.

Another instructor recommended that a "lessons learned" concept be applied to VTT, capturing future vision and focus while growing through an emerging technology.

Particularly in the development stages of VTT instruction, it is useful to keep a notebook on the progress of the course including comments on what went right and wrong and how the elements of the course could be improved. This could be shared with others who are developing VTT courses.

Focus group participants included only successful VTT instructors. What about those who got frustrated and quit? The following comments reflect instructor comments about the natural selection of VTT teachers:

It's not for everybody. The selection of appropriate instructors is critical to the success of VTT instruction.

Instructors need not only to be well qualified technically, but a primary source of success is charisma on camera.

Early instructional innovators took a risk to involve themselves with VTT. The new technology worked, but they had to adapt quickly or quit. Fear turned to enthusiasm, and working teams emerged. It became fun, and the enjoyment demonstrated by these instructors proved to be contagious.

C. THEME III. VTT INSTRUCTORS WORK HARDER

1. Theme

VTT instructors work harder to adopt innovative teaching techniques for lesson preparation and presentation.

2. Discussion

The environment of working with distance education demanded constant application to master new technology. Every panel member had some unique experience to relate about how they created a new application for the technology. New combinations created an environment of discovery (McLuhan and Powers, 1989). The instructors said they worked much harder and that VTT preparation was tedious taking far more time that normal classroom preparation.

For a 60 hour course, I have to put in over 120 hours in preparation.

All instructors strongly punctuated their concern that they thought VTT's greatest weakness was its significant preparation time.

It's tedious. Every exercise takes somewhat longer than it would in the classroom.

Another instructor stressed the concern that she needed to know as early as possible when her next course was beginning, because preparation time took so long for her.

> *Allow for more advanced notice for the instructors involved. Finding materials was the easiest part, but adapting/editing them took time. Printed course materials needed at the remote sites should be sent a week ahead of time. Certain media such as graphics and video segments took extra time to prepare.*

Those who tried VTT found that it altered what had become their normal style of teaching. VTT expanded their ability to adopt innovative technologies and techniques that made the foreign languages accessible to students. Some of them abandoned their textbooks and recorded live-satellite video newscasts from native-speaking countries. This information was current-event-relevant, and the teachers could focus on context differences in the news content from foreign countries compared to the United States. For example, a Persian instructor used daily videotapes from DLI's specially contracted world-wide satellite dish. He thought videotape use received better student response because of the combination of audio and video.

> *Every day I check the satellite schedule and set up my video tape to record Iranian national TV. Sometimes the reception is bad, but usually it's OK. What they talk about is what I talk about for each day's class. It's interesting for the students to discuss the Iranian perspective and what news was left out.*

Another instructor uses videotaped popular movies from Israel. In this case, the movies were culturally oriented, much like home movies, depicting nuances of language and customs that the teacher thought would have been impossible to capture otherwise.

I use movies from home [Israel] to teach my classes.

Teachers found themselves working hard to appear human to overcome the artificiality of image production. It was all right to make mistakes. VTT allows the unique opportunity to explain your mistakes immediately to your audience.

Be yourself. Be natural. Stay cool. If possible, be humorous, tell jokes.

One teacher expressed the thought VTT was more forgiving because it was interactive. He could ask his audience (the students) why a given technique may not have worked.

If I try a new technique and it doesn't work, I ask the students why, and what they would do.

Another example comes from the teacher's enhanced ability to create well-prepared graphics. Some instructors spent hours creating an engaging graphics presentation. When these painstakingly produced graphics are misunderstood, the instructor may have to stop teaching, answer a question, throw away the graphics, and redirect the class with an impromptu hand-drawn sketch to illustrate a point. This frustrating phenomena is reminiscent of early television when embarrassing technological or scheduling failures doomed a live presentation if the cast could not recoup an unanticipated change created by uncontrollable external conditions.

It never fails, when I work all day on a nifty drawing, either the kids [students] can't see it or don't understand it. I have to quickly draw some stick figure to reinforce my point.

Conversely, some participants stated that their behavior before the camera needed to be more scripted. They felt that they didn't feel the freedom to improvise compared with traditional teaching. They felt self-conscious while on-stage behind the VTT camera. They had to work extra hard to appear spontaneous.

I can't do it like that. When I plan my classes, I stay with the schedule and my lesson plan. It makes me work very, very hard to get everything the way I want it. If I work that hard to do a good lesson, the students will stay with the program or I'll just wait til the next class.

Another instructor also felt it was important to be well-scripted.

Know exactly what you're going to do when you're going on.

One technological frustration endemic to VTT is a phenomena named "voice crushing". The voice activated microphone only transmits one speaker at a time. If two students attempt to talk simultaneously, their words are incomprehensibly blended. VTT requires strict discipline in this area.

> *Both VTT teachers and students should be trained to avoid "voice crushing" each other because of microphone sensitivity.*

However, some instructors thought this limitation of VTT was actually an enhancement because speakers had to listen to one another more acutely.

> *You can't interrupt. People listen to each other more intently. It's a novel and pioneering way to teach.*

Experienced instructors learned that they had to have their lessons, graphics, and activities well prepared in advance to present smooth flowing dialogue. They had to be flexible when communications failures occurred. Although breakdowns were infrequent, geographical distance created time-zone and environmental problems. For example, VTT events had to be rescheduled because one site experienced severe weather that closed down the base, while at DLI it was sunny and warm.

> *Because we teach classes from Virginia to Hawaii, we cross some big time zones. I don't think the students know how much we work. For a class at 8 o'clock on the east coast we have to get up before 5 [a. m.], and for a class at 3 [p. m.] in the afternoon at Kunia [in Hawaii] we are here to just start teaching at 6 at night. We bend our schedules for the students, and don't get me wrong, that's the way it's supposed to be, but ...[pause] things happen at the student's end they don't always tell us about, and many times changes are made when the students just don't show up and we are left holding the bag. You [again, pointing across the table] don't get mad at me, but I have to get nasty with them [remote sites]. You know, some [remote sites] are better than others.*

Another instructor believed prepared spontaneity was the key to overcoming unanticipated breakdowns.

Be prepared to jump in with materials if your video or program has a technical malfunction.

D. THEME IV: VTT OVERCOMES DISTANCE BETWEEN STUDENT AND TEACHER

1. Theme

Because the instructor is physically distanced from the students, a special effort is made to make contact between student and teacher.

2. Discussion

Well-planned lesson plans are paramount to any successful teaching strategy. The more complex the lesson in terms of presentation depth, the more flexible the instructor must become to effectively deliver the information. Instructors must intentionally plan to encourage constant contact with the student to bridge the physical distance between instructor and student. Beware, even the best-laid plans fail in execution. With VTT, one can regroup, and query the audience about how to improve a given technique. It is hard and demanding work to present a given lesson from as many perspectives as technologically possible. Distance education provides a rich combination of effort.

It was important that the instructors constantly checked in with the Distance Education office throughout the day to send or receive mail, faxes or student phone calls. Ironically, instructors intentionally planned more direct contact with students over distance than in a face-to-face classroom. Naisbitt and Aburdene (1990) says this phenomenon is not unusual. He calls it the principle of "high tech/high touch". The further technology pushes us forward, the greater the need for personalization at the individual level. Teachers initiated more conscious interaction through faxes.

We need more faxes. Every class at every site needs to send lesson plans and , and other things every day. I use my department's [Russian] fax, and they really get tired of it. We need more equipment!

Some teachers used subtle interaction techniques to maintain student contact.

Every class, I change something on my desk [pointing to the control desk in the studio]. The student who notices it gets recognized.

To appear genuine behind the camera required the instructor to intentionally recognize each student, each day throughout the course, continue to highlight what was happening at the student's site and listen to the students before, during, and after class for a small talk.

When I begin a class, I treat every student like a relative. I quickly tell them about me, then spend lots of time talking about them. We take too much time, I know, but it's the best way for me...I do a little of this in every class.

Because students learn at different rates and bring varying levels of language proficiency to each course, the instructors believed it was important to develop teaching strategies that encompassed all learning styles. Presenting information for students which bridged auditory, visual and kinesthetic stimuli was a significant challenge. For example, students who were auditorially oriented liked to hear recorded newscasts or cultural events clips. Visual learners enjoyed seeing colorful photos or graphics presented on the still-frame viewer. Finally, kinesthetic learners liked to have events which they could physically touch, such as faxed lesson outlines. Overall, the instructors felt that if they planned each day's lesson to incorporate some of each of the three learning styles mentioned above, they became more effective managers of the VTT medium.

As we thought of new strategies, we worked them into a programmed lesson.

One hundred twenty hours of preparation time for a 60-hour curriculum is not uncommon. I need time to plan my video, audio, videotapes, and graphics for logistical reasons without considering my own creativity.

The impetus of technology heightens the stimulus of experience such that the images seen are more real than real life. Baudrillard (Harvey, 1989) says today it is vicariously possible to experience everything from food, music, and entertainment through a series of images on a television screen. This phenomenon is exploited by Epcot and Disneyworld, where it becomes possible to "experience the Old World for a day without actually having to go there". The simulacrum (effigy, image, or representation) created is done in such a way that trace of origin and of the processes that produced it are concealed from the viewer. The simulation becomes reality producing real effects on the participant. Through VTT, students appreciate the simulacram of cultural variances in dress and custom without the annoying interference of noise, flies or bouts of dysentery. Students experience the specific event planned by the instructor without environmental interference. This simulation becomes the student's reality. They can live the event without ever being there though VTT.

VTT was more real than the classroom.

> *When I think about the open-air markets of my home [the Castile portion of Spain], I don't think my American students would appreciate them the way I do. It's not like the commissary or Safeway. The meats are fresh, with flies and all. The fruit and vegetables are wonderful, but we don't use the big stores and their big refrigerators. The markets have strong odors: some are very good and some are very bad. I prefer to show this part of daily life on video tape. It's a lot less messy for the students to learn.*

After accommodating to the new technology, instructors began to find more creative teaching methods to reach out to the students using real-life dialogues from native countries, enacting cultural plays and music, and playing "what if" games for various social or potential work-related situations for the student. These student-activated activities created personal bonds helping to bridge the distance. New combinations of video, audio and interaction created a multifaceted environment from which the student could learn.

I use plays in my Spanish class. In VTT, the students try to dress in their own ideas of Spanish costumes and really dramatize their lines. At first, when it happened I couldn't help but laugh out loud. Now, I encourage them and make suggestions for costumes and how the actors would really sound on Latin TV.

When I bring in my polka music, my students bring in their favorite music and we spend a lot of time listening and discussing them.

Students also responded by making extra efforts to appear human. Besides teachers sharing personal cultural events, students demonstrated an eagerness to share their own family photos and favorite music, and to recognize birth announcements. Students particularly enjoyed sharing their own personal family mementos. When this type of exchange began to flourish, students willingly immersed themselves in a new culture.

We began to do what the students called "show and tell". They enjoyed to show things from their home as much as I did showing them things from mine.

Participating in a teaching role behind a camera, instructors felt that not only did they have to be themselves, but communicating to the students through a television monitor generated more respect from the students. Instructors felt that the students held them in a higher regard than in a normal classroom.

I think you get more attention from students. Do you know why? Maybe they think my face peeks in through the satellite from California to Fort Meade [VA] or, something like that. So, they are more attentive. I don't have to put on airs.

After the instructor accommodated him/herself to the VTT medium to learn the technology, emphasis shifted towards meeting the student's needs. Creating and maintaining a relationship across great distance through a camera is quite a challenge. Teaching strategies must encompass the available spectrum of technology and educational methodology. Even the students reciprocated by responding with personal effort to relate with the instructor through VTT. The

higher the technology the greater the effort to humanize through touch (Naisbitt and Aburdene, 1990).

E. THEME V: VTT IMPROVES STUDENT PERFORMANCE

1. Theme

Student performance demonstrated positive improvement from pre- and post-test results.

2. Discussion

Pre- and post-course DLPT scores were collected for 281 students who attended classes in seven languages over a 15-month period. After careful combing, complete information for 91 students was gleaned from the original data (see Figure 8). The half-point proficiency gain, over a variable range of 1-3, is a positive indicator of the value of VTT.

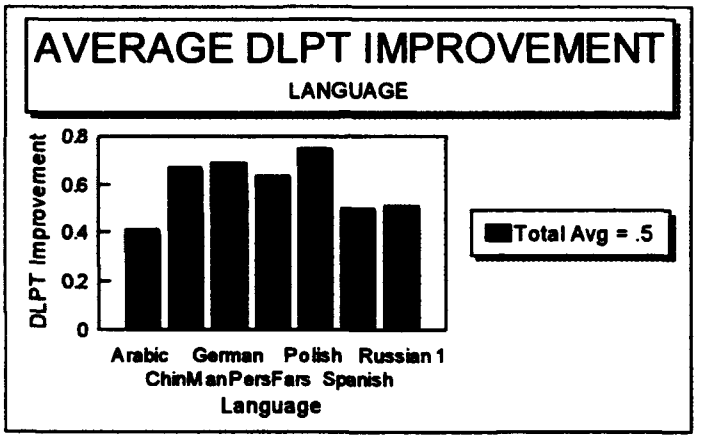

Figure 8. DLPT SCORES ROSE ONE-HALF POINT PER VTT CLASS

Instructor comments on student proficiency follow:

I know for a fact that DLPT scores rise at least a half point with every class I teach. That's got to mean something to somebody. It means a lot, at least, to me.

I could see and hear the improvement in my students. The pre- and post-tests prove it.

Individual differences were accommodated remarkably well, even though the students' language skills were quite disparate. A unique technique developed called "reporting back" evolved to help students with a lower level speaking ability to keep pace with higher level speakers. When a conversation exceeded a given speaker's abilities, studio courtesy dictated that the conversation continue uninterrupted. The struggling speaker would wait until a break in communication and question the more advanced speakers until he/she was brought back into the conversation. This custom created an egalitarian environment where all levels of student proficiency gained from the exchange.

> *For most of the courses I taught, the range of student proficiency level was wide. Students were motivated, and all progressed. The weakest students are the ones who improve the most because they are pushed along with the more experienced ones.*

Bramble (1990) conducted a pilot study of student response to VTT. He evaluated a single course that taught German to an Army interrogation unit. He asked students what they gained from the course. They strongly felt that they improved in vocabulary, grammar, and conversational skills. Some of the student comments from Bramble's study echoed the same enthusiasm exhibited by instructors.

- "I feel much more comfortable in the spoken language as well as in listening comprehension."
- "The instruction and materials were excellent."
- "The quality of instruction was very high and positive. This facilitated both learning and knowledge and how to proceed in my own self study."

VTT demonstrates positive improvement in sustainment language training. Mixed student proficiency levels at remote sites created unique training applications. Even the less experienced student was encouraged to a higher proficiency.

F. THEME VI: INSTRUCTORS FEEL COMMITMENT

1. Theme

Instructors feel commitment to VTT because they believe it is the way of the future and a way to secure personal career growth.

2. Discussion

Participants agreed that change in education was inevitable. The change process is hard, but so was anything worthwhile.

> *I've been in California for a long time. I remember learning how to surf with the other high school boys. It looked hard, and it was, but I stayed with it. This is how I experienced VTT. I believe it is the way of the future. I learned it like I learned to surf. I even have two computers in my home. Technology is not foreign to me. I feel that I must be committed to it. I will ride it through into the future. I am living the future my fellow colleagues are only learning about today.*

Another instructor felt that his experience with VTT helped better secure his future career opportunities. He believed technological exposure coupled with language instruction application gave him a competitive career advantage. He said that he had been already offered positions with international firms needing language training at salaries beyond his expectations. He was waiting for the right offer.

> *Distance education and VTT make my future more secure.*

Those instructors who stayed with VTT shared a common bond of teamwork and became strong advocates, firm in their belief that distance education is the way of the future. They felt that the success of education of the future exists in communicating to students through every means possible. To do that, the instructor must know more about the evolving technology than the students.

> *I think the huge benefit of this type of an education [is] because the generation right now, the young generation, is very much used to the video and all this stuff, so education for them will be more effective using this type of technological stimulation*

that fits their socialization and upbringing, so that's important. I am reminded of this every time I teach. "How can I do this better".

It's the video generation of today. It makes teachers sell application. In a high school, you have to scramble. You have to make it interesting so that students attend your class. It's disheartening, when they just don't show up because they're bored. That's why with VTT students on the other end of the camera are enthusiastic. They are captivated with the technology, and you better keep ahead of them or you're in trouble.

G. SUMMARY

Overall, focus group participants exhibited a deep and genuine respect for VTT. According to their comments, VTT instruction demanded special skills to master the medium. It is not meant for everybody. After initial anxiety, rewards were forthcoming. Through hard work, teamwork and creativity, new combinations for learning emerged. Instructors must always be aware of the artificiality of image production. To overcome artificiality, teachers must strive to keep constant contact with each student. Plan lessons to saturate every learning style (visual, audio, kinesthetic). Instructors kept motivated to expend the extra effort needed by believing that they were riding the educational wave of the future. Furthermore, students demonstrated positive performance improvement. Personal commitment not only made them better teachers, it rewarded their professional status as well. Focus groups proved to be a successful vehicle to capture valuable reactions from VTT primary users.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. Focus Groups Provide Unique Data

Focus groups provided information that could not have been obtained by other research methods. The qualitative data provided a rich source of insight. Participants responded in a candid and honest manner. This study produced three main conclusions derived from the focus group analysis:

- VTT instructors adapt quickly to the medium.
- VTT bridges the distance gap between student and teacher.
- VTT encourages instructors to grow as managers of the medium.

a. VTT Instructors Adapt Quickly to the Medium

Marine Corps interviews expressed concern that one of the stumbling blocks to implement VTT was instructors who were ignorant of how to use the medium. Focus group research richly indicated that once the initial fear is overcome, productive results follow. DLI instructors (already proficient in language instruction) were provided a two-week familiarization period which helped them overcome technological anxiety. Once teachers began to work with the medium, their fears were replaced by enthusiasm and champions emerged eager to teach others how to use VTT. The evolving VTT atmosphere created a motivating work situation at DLI. Hackman and Oldham's (1974) research into job design suggests that the environment of VTT closely parallels their three critical requirements for job motivation: 1) instructors experienced *meaningfulness* in that they became the primary course designers; 2) they felt personal *responsibility* for the success or failure of each course taught; and, 3) student interaction indicated positive *feedback* reinforcing personal satisfaction. Furthermore, the hard work required to

present a VTT class developed a spirit of camaraderie creating a work ethic making it fun and challenging to be part of the team. When VTT is implemented, application for DoD and the Marine Corps is to be prepared to anticipate initial anxiety and support already successful instructors a VTT introductory phase. Planned implementation will enhance job motivation and quickly accommodate new practitioners to the VTT medium.

b. VTT Bridges the Distance Gap Between Student and Teacher

VTT brings training to situations where distance and economics would make conventional education impossible (Wright, 1993). Bridging the distance between student and teacher through high technology demands constant attention by the instructor to maintain daily personal contact with each student. The artificiality of image production imposes a responsibility on the instructor to surround the student with information from as many sources as technically possible (audio, visual, and kinesthetic), and the higher the technology the more the teacher needs to humanize it through touch (Naisbitt, 1990). DoD and the Marine Corps should consider VTT for courses where content and standardization needs to be exact such as professional education and technical training schools. Constant contact through interactive VTT communications uniquely links student and teacher.

c. VTT Encourages Instructor Growth as Managers of the Medium

It is possible to experience almost anything as a simulacrum through the medium of VTT (Harvey, 1989). This places great responsibility on the instructor on how to design lessons to depict most accurately a given subject. Teachers must step away from both the subject and the technology to develop courses that vicariously influence students to experience accurately a new idea or concept. Instructors at DLI demonstrated both a subject and technical expertise. They learned that these skills were effective only when applied in a manner to represent an image in the

best possible way. Managing the media to create the right image is the ultimate goal. Furthermore, they believed in the future of VTT and felt committed to its application. Senge (1990) says that organizations that learn faster than their competitors will survive. Instructors who become more than teachers, who learn to develop the technological medium intentionally responding to an individual student's requirements, demonstrate personal mastery contributing to the creation of a learning organization. Applications for DoD and the Marine Corps should recognize that the instructor needs to be more than a teacher. Instructors need to become masters of a specific subject plus masters of the technology needed to deliver that subject in the most efficient manner. Instructors need to become managers of the medium.

2. DoD and Marine Corps Use of VTT

Proper implementation of distance education requires strategic thinking and vision. The goals of an organization must be considered when comparing costs, benefits, and limitations of various educational methods. Distance education produces results other training methods cannot accomplish. An initial successful implementation sets the tone for future system acceptance. Converting conventional training to distance education requires prior process improvement and re-engineering. Distance education can be effective when incorporated into a complete training system rather than as a stand-alone resource. This study produced two primary conclusions from an analysis of VTT for DoD and the Marine Corps.

a. Technical Standards

The standard presented by FIPS Pub 178 provides adequate direction and policy guidance. The follow-on DoD level standards emphasize the importance of "open architecture".

Improvement may be needed for tailored solutions to fill gaps where standards are not yet available.

b. Money Saving Management Practices

Outsourcing and prototyping should be applied to VTT implementation for DoD and the Marine Corps. Outsource the constantly evolving technology. It reduces risk on behalf of the supporting agency. Prototype initial applications and provide a learning organization to capitalize on an evolving technology.

B. RECOMMENDATIONS

The Marine Corps should implement distance education in the form of videoteletraining. Out source the technological risk and develop quality applications. The following recommendations are offered:

- Anticipate initial resistance to VTT applications.
- Develop a supporting infrastructure for VTT.
- Outsource the technology.
- Establish close liaison with other agencies who use VTT.
- Develop VTT support in conjunction with existing training programs.
- Key supporters should attend seminars.
- Prototype pilot applications.
- Review current curriculums and decide which courses could use distance education application.

1. Follow-on Considerations

The following areas are possible areas for future research:

- Economic analysis should continue.
- Develop further case study analysis.
- Assist an organization in implementing a VTT program.
- Look at other ways telecommunications can offer improved training.

2. Learning Organizations

The organization that learns the fastest will survive (Senge, 1990). Offering quality training on demand through videoteletraining is an enticing proposition that is available today.

With jobs becoming broader in scope and more complex, workers need assistance to accomplish tasks both individually and collectively.

- Systems Thinking. Organizational vision will enhance systems thinking to help people change patterns effectively. People can understand an organization's system only by relating individual parts to the whole. Goal #7 for the Marine Corps (*United States Marine Corps Pamphlet*, 1994) fits this concept nicely: "To provide a continuous program of comprehensive education to ensure that Marines meet the demands of their profession". VTT immediately broadcasts a commander's priorities to a broad population.
- Personal Mastery. Videoteletraining offers personal rich rewards for both instructors and students. Outsource the technological concerns and embrace mastery of the medium.
- Mental Models. The Marine Corps could be the world leader in developing deeply ingrained assumptions, generalizations, and images that influence technological change and growth.
- Shared Vision. With a supporting infrastructure of interoperable standards, quality training programs, and continuous customer need refinement, the Marine Corps will succeed in distance education.
- Team Learning. Team learning is essential in learning organizations. Everyone has at one time been a part of a great team which functioned in an extraordinary way. Most of us spend our lives trying to re-create this close knit relationship. The Marine Corps is an composite of effective teams. VTT offers the means to thread these independent teams into a tighter organizational fabric for the betterment of the entire organization.

C. THE FUTURE

Distance education will become more accepted and integral to training. Portaway and Lane (1992) state:

> If the use of media and technology is to increase, educators must learn how to reach educational goals and objectives through electronically mediated course instruction.

The increased use of distance education through videoteletraining is happening throughout industry and DoD. It is time for the Marine Corps to take advantage of the technology and develop further into a learning organization.

APPENDIX A. FOCUS GROUP DISCUSSION GUIDE

A. GENERAL INFORMATION

1. Facilitator introduction.
2. Disclosure of videotaping and confidentiality.
3. Purpose: Discover what you believe are the most important factors for a successful Distance Education program.
4. Demographics (name, occupation, years of experience with distance education)
5. Guidelines for conduct.
6. Individual Introductions.

B. CRITICAL FACTORS

1. Do you find distance education to be a satisfying field? If so, how is it motivating?
2. How much enthusiasm does your organization demonstrate towards distance education?
3. What do you think about funding issues for distance education?
4. How would you compare traditional teaching methods to distance education?
5. What are your concerns for the future of distance education?

C. CLOSING COMMENTS

APPENDIX B. GLOSSARY

The terms in this glossary were chosen from the Glossary of Telecommunication Terms, FED-STD-1037, A NATIONAL COMMUNICATIONS SYSTEMS, 1986.

Analog signal. A continuously varying electromagnetic wave that may be propagated over a variety of media.

Analog transmission. The transmission of analog signals without regard to content. The signal may be amplified, but there is no intermediate attempt to recover the data from the signal.

Asynchronous transmission. Transmission in which each information character is individually synchronized (usually by the use of start elements and stop elements).

Bandwidth. The difference between the limiting frequencies of a continuous frequency spectrum.

Bridge. A device that links two homogeneous packet-broadcast local networks. It accepts all packets from each network addressed to devices on the other, buffers them, and retransmits them to the other network.

Broadcast. The simultaneous transmission of data to a number of stations.

Codec. Transforms analog data into a digital bit stream (codec) and digital signals into analog data (decoder).

Data terminal equipment (DTE). Equipment consisting of digital end instruments that convert the user information into data signals for transmission, or reconverts the received data signals into user information.

Digital data. Data consisting of a sequence of discrete elements.

Digital signal. A discrete or discontinuous signal, such as voltage pulses.

Digital transmission. The transmission of digital data, using either an analog or digital signal, in which the digital data is recovered and repeated at intermediate points to reduce the effects of noise.

Digitize. To convert an analog signal to a digital signal.

Frequency. Rate of signal oscillation measured in hertz.

Gateway. A device that connects two systems, especially if the systems use different protocols. For example, a gateway is needed to connect with independent local networks, or to connect a local network to a long-haul network.

Internet. A collection of packet-switched and broadcast networks that are connected together via gateways.

Ku band. Satellite band measured in Gigahertz (GHz), meaning uplink: 14 to 14.5 GHz and downlink: 11.7 to 12.2 GHz. This band is well suited for VSAT applications.

Message switching. A switching technique using a message store-and-forward system. No dedicated path is established. Each message contains a destination address and is passed from source to destination through intermediate nodes. At each node, the entire message is received, stored briefly, and then passed on to the next node.

Modem. Transfers a digital bit stream into an analog signal and vice versa.

Multicast address. An address that designates a group of entities within a domain.

Multiplexing. In data transmission, a function that permits two or more data sources to share a common transmission medium such that each data source has its own channel.

Multipoint. A configuration in which more than two stations share a transmission path.

Optical fiber. A thin filament of glass or other transparent material through which a signal-encoded light beam may be transmitted by means of total internal reflection.

Outsource. Management practice to improve return on assets by moving these assets off the financial books while retaining control over their use. This relationship implies service level agreements for contract management whose goal is to increase power and reduce risk.

Point-to-point. A configuration in which two stations share a transmission path.

Prototype. A development tool where an experimental version of a new system is introduced based on specific user requirements. Enhancements and changes are constantly applied to improve the model's performance based on user inputs. A typical prototype has four to six iterations.

Synchronous transmission. Data transmission in which the time of occurrence of each signal representing a bit is related to a fixed time frame.

Transmission medium. The physical path between transmitters and receivers in a communications system.

Twisted pair. A transmission medium consisting of two insulated wires arranged in a regular spiral pattern.

Very small aperture terminal (VSAT). Low cost satellite antenna system used for business applications. A number of terrestrial VSAT antenna users can exchange messages with hubs and between other subscriber stations.

LIST OF REFERENCES

Bass, Brad, *"Feds Slow to Buy Videoconferencing Systems", Federal Computer Week,* December 6, 1993.

Bergstein, Mel, *TSC,* 205 N. Michigan Ave., Chicago, IL 60601.

Brewin, Bob and Bradd Bass, *"Senate Panel Seed Ground for Joint Net", Federal Computer Week, January* 27, 1994.

Bowsher, Jack E., *Education America: Lessons Learned in the Nation's Corporations,* John Wiley, New York, 1989.

Bramble, WIlliam J., *Review on Synthesis of the Literature: Distance Education and Its Relevance to Foreign Language Training ETNA Project Report,* November 1990.

C4I for the Warrior, 12 June 1993.

Comcowich, W. J., *"Integrating Multimedia Into Your Organization", Multimedia and Videodisc Monitor,* v. 10, n. 10, pp. 24, October 1992

Demot, J. S., *"Multimedia Mirage", Federal Computer Week,* v. 6., n. 30, pg. 25, September 1992.

Emory, William C., and Donald R. Cooper, *Business Research Methods,* Irwin, Inc., Boston, 1991.

FIPS Pub 178, *Video Teleconference Services at 56 to 1920 KB/S,* U. S. Department of Commerce, 21 December 1992.

Fletcher, J. D., Institute for Defense Analysis IDA Paper P-2372, *Effectiveness and Cost of Interactive Videodisc Instruction in Defense Training and Education,* July 1990.

Freeman, Roger L., *Telecommunication Transmissions Handbook,* John Wiley and Sons, Inc. 1991.

Gibson, Chuck, *CSC Index*, 5 Cambridge Center, Cambridge, MA 02142.

Glaser, B., and A. Strauss, *The Discovery of the Grounded Theory*, Aldine, Chicago, 1967.

Hackman, Richard T. and Greg L. Oldham, *Job Diagnosis Theory*, Yale University Press, May 1974.

Harvey, David, *The Condition of Postmodernity*, Basil Blackwell, Inc, Cambridge, MA, 1989.

Keegan, Desmond J., "On Defining Distance Education", *International Perspectives*, 1983, pp. 6-33.

Kruger, Richard A., *Focus Groups: A Practical Guide for Applied Research*, Sage Publications, Newbury Park, London, 1988.

Lyton, Ernest A., *"From the Editor's Desk", Metropolitan Universities*, 1992, Vol. 3, No. 1, pp. 2.

McLuhan, Marshall and Bruce R. Powers, *The Global Village*, Oxford University Press, New York, 1989.

MIL-STD 188-331 (Draft), *Draft Military Standard Interoperability and Performance Standard for Video Teleconferencing, Defense Information Systems Agency*, 10 November 1993.

Military Manpower Training Report (MMTR) for FY 1993, U. S. Department of Defense, June 1992.

Naisbitt, John and Patricia Aburdene, *Megatrends 2000*, William Morrow and Company, Inc., New York, 1990.

Payne, E. T., *Benton Foundation Paper: Interactive Multimedia: an Overview*, April, 1991.

Peters, Tom, *Liberation Management*, Alfred A Knopf, Inc., 1992.

Portaway, Patrick S., and Carla Lane, *Technical Guide to Teleconferencing and Distance Education Learning,* Applied Business TeleCommunications, 1992.

Pugh, Lauren, H., Stephen W. Parchman and Henry Simpson, *Field Survey of Videoteletraining Systems in Public Education, Industry and the Military,* Navy Personnel Research and Development Center, March 1991.

Senge, Peter, *The Fifth Discipline: The Art and Practice of the Learning Organization,* Doubleday, New York, 1990.

Sprague, Ralgh H. and Barbara C. McNurlin, *Information Systems Management in Practice,* Prentice Hall, Inglewood Cliffs, New Jersey, 1993.

Strauss, Anslem and Juliet Corbin, *Basics of Qualitative Research: Grounded Theory Procedures and Techniques,* Sage Publications, Newbury Park, London, 1990.

Sweltz, Ken W., *Analysis of Implementing Multimedia Computing Systems for Training Applications Within the United States, Marine Corps,* Masters Thesis, Naval Postgraduate School, Monterey, California, September 1993.

United States Marine Corps Pamphlet: A Tradition of Honor, A Vision of the Future, 1994.

Wartzman, Rick, *"Clinton Captures the Words and Pulse of the Nation", The Wall Street Journal,* 15 March 1994.

Wilson, Douglas A., "Videoteleconferencing: A Viable Option for the Marine Corps", *Marine Corps Gazette,* October 1993.

Wright, E. E., "Making the Multimedia Decision: Strategies for Success", *Journal of Instructional Delivery Systems,* V.7, N. 1, pp. 15-16, Winter 1993.

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